UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/693,519	10/27/2003	Shelly John Mechery	2343-173-27	2226

7590 01/24/2006

Supervisor, Patent Prosecution Services
PIPER RUDNICK LLP
1200 Nineteenth Street, N.W.
Washington, DC 20036-2412

EXAMINER	
STAHL, MICHAEL J	

ART UNIT	PAPER NUMBER
2874	

DATE MAILED: 01/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/693,519	MECHERY ET AL.	
	Examiner	Art Unit	
	Mike Stahl	2874	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 November 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-45* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-29 and 31-45* is/are rejected.

7)☒ Claim(s) *1,22,24,30 and 36* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *3/15/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Election/Restriction

Applicant elected Group I with traverse. However, upon reconsideration the examiner has opted to process all the claims together. Accordingly the previous restriction requirement is withdrawn.

Claim Objections

Claim 1 is objected to because in line 6, "inroganic" should be "inorganic".

Claim 22 is objected to because in line 2, "sensing device" should be "sensing element".

Claim 24 is objected to because in line 1, "sensing device" should be "sensing element".

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 35-37, and 39-40 are rejected under 35 U.S.C. 102(b) as being anticipated by Tanaka et al. (US 6362005). This reference was cited on the IDS submitted March 15, 2004.

Claim 35: Tanaka discloses a nitrogen oxide sensing element **103a** comprising a microporous matrix **103** of an optically transparent inorganic compound; a diazotizing reagent which reacts with nitrous ions to produce a diazo compound; and a coupling reagent which couples with the diazo compound to produce an azo dye; wherein the diazotizing reagent and the coupling reagent are immobilized in the microporous matrix. See e.g. col. 2 lns. 27-40 and col. 3 ln. 63 – col. 4 ln. 35.

Claim 36: Tanaka teaches that the porous sensor body may be made by a sol-gel process (col. 6 lns. 35-37). It is considered inherent that the matrix in that embodiment includes a metalorganic compound. See e.g. specification at p. 9 lns. 1-6.

Claim 37: The microporous matrix in the main example comprises SiO_2 (col. 4 ln. 14).

Claims 39-40: In one embodiment the diazotizing reagent is sulfanilamide and the coupling reagent is N,N-dimethyl-1-naphthylamine (col. 7 lns. 24-29).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka et al. (cited above).

Claim 38: Tanaka does not disclose a specific example in which the diazotizing reagent and the coupling reagent are present in equal molar proportions (the proportions in an exemplary embodiment are 0.02 mol/l for SFA and 0.005 mol/l for DMNA). However, it has been held that optimization of a result-effective variable is obvious absent any evidence indicating that the claimed value is critical (MPEP 2144.05 II). The relative molar proportion of SFA and DMNA is regarded as a result-effective variable since changing it would alter the sensitivity of the sensor. Thus it would have been obvious to a skilled person to have determined an optimal relative molar proportion of SFA and DMNA in the Tanaka device in the interest of optimizing the effectiveness of the sensor.

Claims 1-16, 26-28, 31, and 34-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shaw et al. (US 6445861) in view of Tanaka et al. (cited above).

Claim 1: Shaw discloses a method of making a sensing element including: incorporating a dopant into a sol; and allowing the sol to gel; wherein the gel includes a microporous optically transparent inorganic matrix including immobilized dopant (see e.g. col. 11 ln. 63 – col. 12 ln. 14; col. 12 ln. 58 – col. 13 ln.7). Although chemical sensors are mentioned, a sensor specifically for nitrogen oxide is not. As noted above with regard to claims 35 and 36, Tanaka discloses a diazotizing/coupling reagent pair suitable for detection of nitrogen oxide, and teaches that the reagents may be introduced the pores of a body created by a sol-gel method. A nitrogen oxide sensor per se is clearly useful, and the Shaw reference describes numerous advantages arising from its particular sensor design. Thus it would have been obvious to a skilled person to have made a nitrogen oxide sensor by applying the Shaw method and using as dopants the diazotizing/coupling compounds taught by Tanaka.

Claim 2: The sol includes a metal alkoxide or a metalorganic compound (tetraethyl orthosilicate).

Claim 3: TEOS is an alkoxysilane.

Claim 4: Shaw does not specifically disclose including TMOS in the sol. However, it is well known in industry that TMOS and TEOS are usually interchangeable as silicon sources for sol-gel processes. It would have been obvious to a skilled person to have used TMOS in place of TEOS since it is known that TMOS hydrolyzes more quickly and therefore one would reasonably expect the gel formation time to be reduced.

Claim 5: The diazotizing reagent taught by Tanaka is sulfanilamide.

Claim 6: The coupling reagent taught by Tanaka is N,N-dimethyl-1-naphthylamine.

Claim 7: The method further includes transferring the sol into the cavity of a mold and allowing it to gel therein (see e.g. fig. 2; col. 11 lns. 56-61).

Claim 8: The mold is a tube (hollow fiber) and the cavity of the mold is the hollow interior of the tube.

Claim 9: The sol may be formed into a film (outer layer in fig. 6; col. 18 lns. 25-34).

Claim 10: The Tanaka reference does not provide a specific example in which the diazotizing reagent and the coupling reagent are present in equal molar proportions (the proportions in an exemplary embodiment are 0.02 mol/l for SFA and 0.005 mol/l for DMNA). However, it has been held that optimization of a result-effective variable is obvious absent any evidence indicating that the claimed value is critical (MPEP 2144.05 II). The relative molar proportion of SFA and DMNA is regarded as a result-effective variable since changing it would alter the sensitivity of the sensor. Thus it would have been obvious to a skilled person to have determined an optimal relative molar proportion of SFA and DMNA in the proposed combination in order to maximize the effectiveness of the sensor.

Claim 11: In one embodiment of the Shaw invention, the mold includes a "Tygon" tube. However, Shaw states that other materials may be used so long as they do not react with or stick to the sol-gel material (col. 12 lns. 12-14). Thus it would have been obvious to a skilled person to have optionally used a PTFE tube since teflon tubes are widely available, chemically inert, and non-sticky.

Claim 12: The method proposed above with respect to claim 1 produces a nitrogen oxide sensing element.

Claim 13: The shape of the sensing element in fig. 2 is a solid cylindrical body.

Claim 14: The shape of the sensing element in fig. 6 (outer element) is a film.

Claim 15: See above with respect to claim 13. A cylindrical body is a disc.

Claim 16: The fig. 10 embodiment includes a sensing element, a light source, and a detector, wherein the sensing element is coupled to the light source by one or more transmitting optical fibers and is coupled to the detector by one or more receiving optical fibers such that light from the source goes through a transmitting fiber, impinges on the sensing element, and goes through a receiving fiber to the detector.

Claim 26: The sensing element is in the form of a three dimensional elongate solid body having a proximal and a distal end.

Claim 27: See Shaw fig. 10.

Claim 28: The sensing element is in the shape of a cylindrical solid body.

Claim 31: Shaw does not disclose a specific spectral distribution for the light source. Determination of an appropriate range would have been obvious to a person skilled in the art

since it is based on well known factors such as the absorption or emission band of the sensing dopants, and the transparency range of the materials which constitute the matrix and the fibers.

Claim 34: Shaw does not mention a personal computer interfaced to the detector for collecting data. It would have been obvious to a skilled person to have interfaced a computer to the detector for data collection since computers are better suited to that type of activity than people are.

Claims 35-40: The limitations of these claims are met by the above-proposed combination of Shaw in view of Tanaka.

Claims 1-6, 9, 12, 16-25, 29, 32-37, and 39-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morris et al. (US 2003/0068827) in view of Tanaka et al. (cited above).

Claim 41: Morris discloses a sensor comprising: a light source **20**, an optical detector **80**, and a film sensing element **43**, wherein the sensing element is coupled to the light source by one or more transmitting optical fibers and is coupled to the detector by one or more receiving optical fibers such that light from the light source is transmitted through a transmitting fiber and impinges on the sensing element and is transmitted through a receiving fiber to the detector; and wherein ends of the transmitting and receiving fibers adjacent the sensing element are positioned on the same side of the film sensing element. Morris does not disclose a nitrogen oxide film sensing element having the recited reagents. Tanaka discloses a sensing element including the recited reagents as pointed out earlier in this action. Both references are directed to gas sensing and both use sensing elements based on porous bodies created by a sol-gel process. Thus it would have been obvious to a skilled person to have used the nitrogen oxide sensing reagents of Tanaka in making the element **43** of Morris since this would enable the Morris device to be used for detecting nitrogen oxide.

Claim 42: Morris does not specifically disclose a mirror. However, since one of the goals of Morris is to enhance the amount of light which enters the receiving fiber (e.g. [0037]), it would have been obvious to a skilled person to have provided a mirror on the other side of the sensing element to catch light from the source which passes through the element and re-use it rather than letting it be wasted e.g. by absorption in the end cap **44**.

Claim 43: The film sensing element **43** is positioned so that light impinging thereon is reflected by it into one or more receiving fiber ends.

Claim 44: The sensor in the exemplary embodiment does not include a mirror.

Claim 45: The ends of the transmitting and receiving fibers adjacent the sensing element are bundled into an optical fiber cable (figs. 3-4) having a planar cable end adjacent the film sensing element, and the planar surface of the film sensing element is oriented at an angle to the adjacent planar cable end.

Claim 1: Morris teaches immobilization of the sensor compounds within a transparent inorganic matrix and teaches that the compounds should be added to the sol before gelling ([0002], [0051]-[0052]). Accordingly the process of making the above-proposed combination of Morris in view of Tanaka includes all the recited method steps of claim 1.

Claims 2-4: The recited compounds are disclosed in [0051] of Morris.

Claims 5-6: The recited compounds are taught by Tanaka for nitrogen oxide sensing.

Claim 9: The sol is formed into a film.

Claim 12: The method of making the proposed combination produces a nitrogen oxide sensing element.

Claim 16: Morris further teaches the sensing element **43**, a light source **20**, an optical detector **80**, wherein the sensing element is coupled to the light source by one or more transmitting optical fibers and is coupled to the detector by one or more receiving optical fibers such that light from the source goes through a transmitting fiber, impinges on the sensing element, and goes through a receiving fiber to the detector (fig. 2).

Claim 17: The transmitting and receiving optical fibers are combined in the form of a Y-shaped optical cable **30** having a single distal end comprising ends of both transmitting and receiving fibers, a first proximal end comprising the ends of one or more transmitting fibers **31** and a second proximal end comprising the ends of one or more receiving fibers **32**; wherein the distal end of the Y-shaped optical cable is placed in optical communication with the sensing element; wherein the first proximal end of the Y-shaped optical cable is placed in optical communication with the light source; and wherein the second proximal end of the Y-shaped optical cable is placed in optical communication with the detector.

Claim 18: Morris teaches that there may be a single transmitting fiber and a plurality of receiving fibers, depending on the relative sizes of the light source and the detector area ([0065]).

Claims 19-20: Morris shows the recited arrangement of fibers in fig. 4, except that there is one receiving fiber and six transmitting fibers. An alternate embodiment having one transmitting fiber and six receiving fibers is considered to be within the scope of the invention (see [0065]). In that case it would have been obvious to a skilled person to arrange the six receiving fibers around the single transmitting fiber since this provides a compact arrangement which will easily fit into a cylindrical probe such as **40**.

Claim 21: The sensing element **43** is in the form of a film (a membrane).

Claim 22: See above with regard to claim 42.

Claim 23-25: See figs. 2-3 of Morris.

Claim 29: See above with regard to claim 45.

Claims 32-33: The detector **80** is a spectrometer including a CCD. It is considered inherent that the spectrometer includes a grating.

Claim 34: Computer use is mentioned at [0068].

Claims 35-37 and 39-40: The sensing element produced by the proposed combination meets the limitations of these claims.

Allowable Subject Matter

Claims 30 and 46 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The applied references do not teach or suggest placing the film sensing element at the Brewster angle relative to the planar cable end. Shaw combined with Tanaka is not seen as meeting the limitations of respective parent claims 21, 29, 41, 43, or 45. Although Morris combined with Tanaka meets the limitations of all these parent claims, it is not considered obvious to place the film sensing element at the Brewster angle because this would likely reduce the reflection of one polarization component, which seems contrary to Morris' goal of enhancing the total amount of light collected from the sensor.

Conclusion

The additional references listed on the attached PTO-892 form are considered relevant to the subject matter of this application.

Inquiries about this letter should be directed to Mike Stahl at 571-272-2360. Inquiries of a general or clerical nature (e.g., a request for a missing form or paper, etc.) should be directed to the technical support staff supervisor at 571-272-1626. Official correspondence which is eligible for submission by facsimile and which pertains to this application may be faxed to 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Questions about the Private PAIR system should be directed to the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Mike Stahl MJS
Patent Examiner
Art Unit 2874

January 14, 2006

SUNG PAK
PRIMARY EXAMINER